



# BX RANGLANDS DEVELOPMENT PLAN

## Site Assessment Report

Institute for Sustainable Food Systems and Land to Table Network

July 2022

### Prepared for:

Regional District of North Okanagan



Institute for Sustainable Food Systems



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# Introduction

The BX Ranchlands property at 4122 East Vernon Road is located within the boundaries of Electoral Area C. It has been proposed to have a mix of agricultural, conservation, and recreational uses. The following site assessment outlines the unique biophysical, social, and cultural characteristics of the site influenced by the historical, and current, uses of the land. This analysis will determine the suitability of the site for the site objectives outlined by the Regional District of North Okanagan (RDNO) and the project Working Group. It will clearly outline recommended site management considerations.

This site assessment includes three different components:

1. *Context analysis*
2. *Site analysis*
3. *Soil analysis*

## 1. Context Analysis

### 1.1 BX Ranchlands First Nations History

The land is part of the traditional, unceded territories of the Okanagan Indian Band (OKIB) of the Syilx Okanagan Nation. The traditional lands of the OKIB span from the northernmost point from Mica Creek, BC, down south to Wilbur, Washington State, and extend from the west from Guichon Creek over to Kootenay Lake in the east (Our History, 2021). The Secwépemc Nation's traditional territory stretches across much of the interior of British Columbia: from the Columbia River valley along the Rocky Mountains, west to the Fraser River, and then south to the Arrow Lakes. Most people live in the river valleys (Tk'emlúps, 2021). Traditionally, the BX Ranchlands was part of a vital travel corridor and seasonal settlement area for these nations, each specific ecosystem within the territory dictating the specific activities connected to the land: hunting, fishing, gathering, and ceremonies (Our History, 2021).

These lands were not put in treaty but rather were taken by settler communities in the early 1800's; settler communities came for the fur trade and gold rush (History- Barnard's Express, 2022). The existing community residents of Swan Lake and BX have a strong relationship to the site and value its importance as wildlife habitat, as well as existing and proposed recreational opportunities on the land. The current Area B and C Directors, as well as the local agricultural community see the value and potential of the land in terms of agricultural production. Being a part of the Agricultural Land Reserve, the land must continue to be stewarded in a way that supports and promotes agricultural production.



Image Source: Kristi Tatebe



## BX Ranchlands Parcel Characteristics

### 1.2 BX Ranchlands Agricultural History

The BX Ranchlands property is part of the historic BX Ranch, after which the BX neighbourhood takes its name (Barnard's Express History, 2019). Originally a 6,000 acre ranch, the BX Ranchlands property under discussion here is one of the largest remaining parcels of the original ranch. At the height of the gold rush, demand for efficient transportation of goods and people was high. One company, Barnard's Express (1862–1878), named after its owner Francis Barnard, later known as BX or the British Columbia Express Company (1878–1921), provided this transportation service through a stagecoach line (Stagecoach North: A History of Barnard's Express, 2021). The BX Ranchlands property on East Vernon Road provided pasture and hay for horses of the BX Express stagecoach service. Water rights for irrigation were established on BX Creek in 1873, and water was brought onto the farm by gravity ditch irrigation. From the late 1800s, the land has almost exclusively been used for pasture and forage production, with an attempted planting of fruit trees that failed due to widespread frost.

### 1.3 Location

BX Ranchlands is a 167-acre property located on Agricultural Land Reserve (ALR) land in Electoral Area C, BC at 4122 East Vernon Road. Approximately 35-acres have been subdivided at the South and West perimeter of the property, and are owned and managed by the RDNO as a part of their Greater Vernon Parks and Trail system. Another portion of trail along the North and East sides of the property has been proposed by Electoral Areas B and C, and an application is currently under review by the ALC. The property is surrounded by residential single-detached home properties, BX Park, Mutrie Road Dog Park, and Black Rock Park. Close in vicinity are two elementary schools: Hillview and Silver Star, and Vernon Secondary School is within walking distance. Properties of this kind and size are increasingly rare, especially in the North Okanagan where there is continued urbanization and agricultural land values are consistently increasing. It is currently being managed by a local forage farmer, and the RDNO Parks Department.

In 2015 the RDNO completed a Regional Agricultural Plan (RAP) emphasizing the importance of maintaining a secure food supply that community residents feel connected to, as well as keeping farmland affordable to farms of all sizes (Smith, Lawseth, De La Salle, & Marshall, 2015). The RAP also cites the importance of involving government officials at various levels, the public, as well as non-profit organizations enhancement of regional agriculture. The accompanying site development plan supports these key visions in a multitude of ways.

### 1.4 Zoning

Zoned as Large Holding (LH) in the City of Vernon's Official Community Plan (OCP), the land in question remains a part of the Agricultural Land Reserve (ALR) in its entirety and is owned by Electoral Areas B and C. There are only two other ALR parcels of similar size within Electoral Area C, otherwise all ALR parcels have been subdivided (Regional District of North Okanagan, 2014, 23). The parcel on which this site development plan is proposed to take place (KAP76102) is surrounded by properties zoned 'Country Residential' that remain part of the ALR. Properties along the eastern portion were subdivided from the original BX Ranchlands property. An observational survey of the neighbourhood did not show any visible agricultural uses on adjacent lots other than pasture for horses, a few cattle, and some small lot hay production. A non-farm use application has previously been submitted to the Agricultural Land Commission (ALC) to allow for the construction of a perimeter trail along the north and east sides of the property to connect the existing trail on the south and west sides. agriculture. The accompanying site development plan supports these key visions in a multitude of ways.

# BX Ranchlands Agricultural History

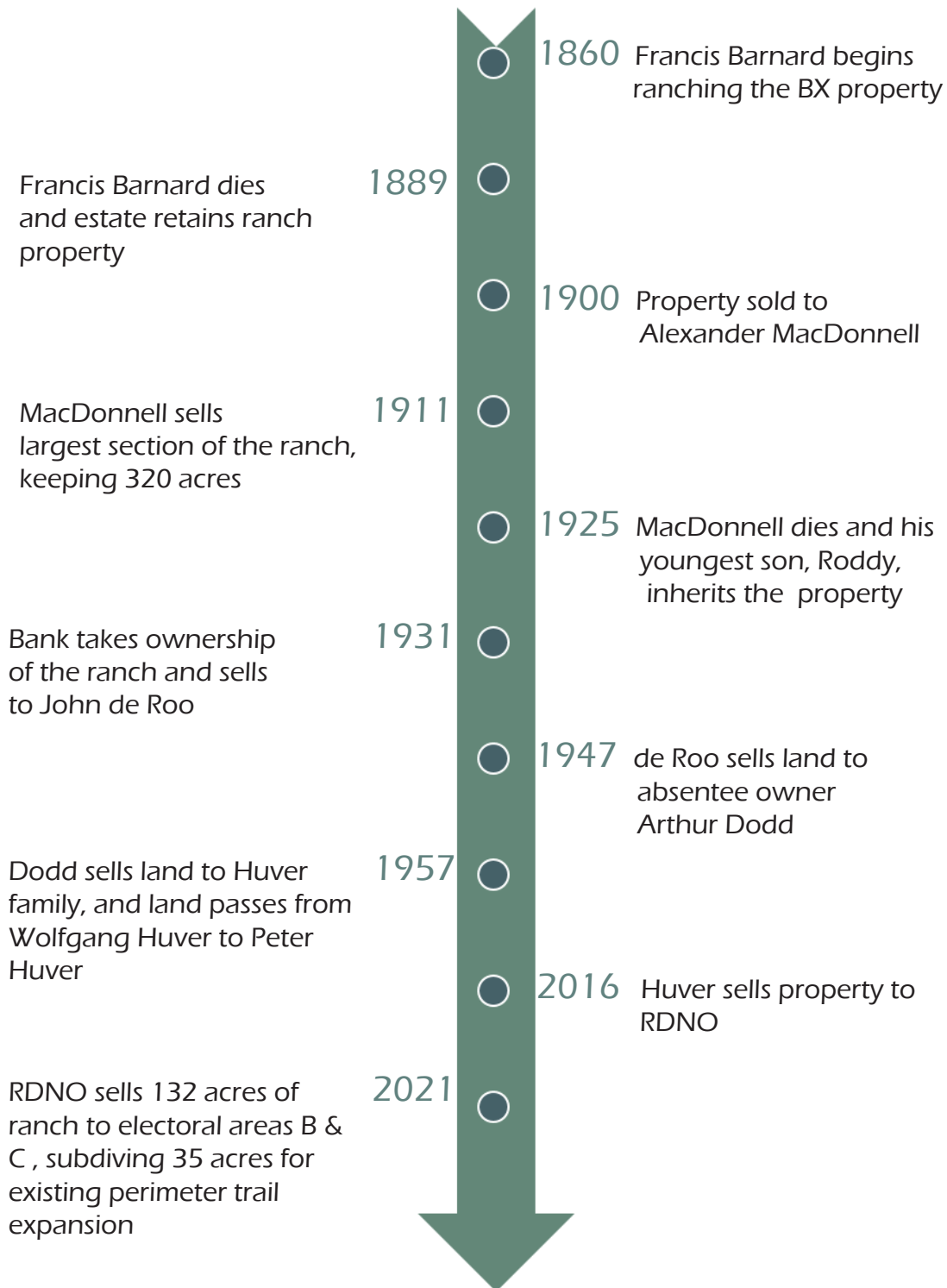


Figure 1: BX Ranchlands Ownership History

## 2. Site Analysis

### 2.1 Site Visit Assessment

Kwantlen Polytechnic University's Institute for Sustainable Food Systems (KPU ISFS) team of agriculture specialists completed a site visit on November 4th, 2021 alongside project partners from the RDNO and the Land to Table Network (L2T), and observed the following of the BX Ranchlands property. It was late morning, clear and overcast, with an average temperature of 6 degrees Celsius. The site was accessed on foot at the main entrance off of East Vernon Road, through the existing farmyard, heading west along the centre of the property, and followed the perimeter fence line north, across the top of the property, to the eastern fence line, and south back through the farmyard.

KPU ISFS team member, Annelise Grube-Cavers, visited the site many more times from November 2021 through May 2022, meeting with current land tenant and manager, Allen Arndt. These visits greatly informed the team's understanding and knowledge of the property and its characteristics, leading to informed decision making throughout the project.

The following sections provide detailed information that was observed from site visits, and previous analysis of the site by Associated Environmental (Associated Environmental, 2019) and Summit Environmental Consultants Inc. (Summit Environmental Consultants Inc, 2015).

The 132 acres included in this report, while all arable, still has some significant topographical changes that determine drainage and air flow, resulting in some lower, wetter, and colder areas more prone to frost.

Also observed during these visits was significant disturbance caused by pocket gophers, which can sometimes present as an agricultural pest depending on the crop being produced, but also bring benefits in terms of soil aeration and movement of nutrients and micronutrients from subsoils to surface soils.

The property does receive significant annual snowfall, but is almost all workable on an average year by early May. Some of the lower portions where drainage feeds off the property may remain unworkable until after the freshet has ended in years with more precipitation, or fast snowmelt. This could be anywhere from mid-April to mid-June (in cold spring years with late snow melt, such as 2022).

From north to south there is a slight rise at the midline of the property, with the highest point being a denser clay soil that has mostly brome grass, and is on both the Spallumcheen and Broadview soil types. Allen Arndt confirmed that under his stewardship of more than 36 years, that portion of land has never been tilled, and is not generally irrigated as the denser clay soils, and higher grade of slope leads to quick runoff.



Image Source: Kristi Tatebe

Farmyard

Significant organic matter would need to be added to that portion of the field to increase the water absorption rate and water holding capacity for it to be suitable for all crops. Even as-is, it can produce significant forage in a year with sufficient precipitation.

## 2.2 Existing Infrastructure

- Perimeter fencing between the perimeter trail and the main farmland parcel: 6ft wooden posts, page wire at 5ft, and barbed wire line on top of the page wire. This fencing is currently installed around the south and west perimeters of the property (bordering the RDNO operated trail).
- Historical Barn, needs some minor maintenance, and is reportedly home to endangered species of bat; close to right beside parking lot (Figure 1).
- Two covered pole-barn structures in the farm center area (both built at the expense of Allen Arndt):
  - Main barn: 114ft x 24 ft.
  - Figure 2) -Small barn: 44ft. x 20ft.
- Five water meters'/water access points.
- Internal fencing is aging, but could still be repaired and utilized, especially around the historical barn where there is a small paddock and chute for handling cattle.
- Parking lot off of Old Vernon Road.
- Existing perimeter trail, and area for extension.



Image Source: Jenn Cline

Historic Barn



Image Source: Annelise Grube-Cavers

Pole Barn

## 2.3 Regional Climate

a) Climate classification: Warm Summer Continental Climate, generally referred to as humid continental, having four distinct seasons with large temperature differences (Classification: Dfb by Köppen and Geiger) (Vernon, British Columbia, Canada Climate, n.d.).

b) Mean temperatures: Average annual temperature is 7.7C, mean winter temperature (November to March) is below 0C, and mean summer temperature (June to September) above 23C (Climate and Average Weather Year Round in Vernon, n.d.).

c) Rainfall: An annual average of 663mm, occurring February through December (Fitzpatrick, 2022).



d) Snowfall: An annual average of 909mm, generally occurring November through March (Yearly Snowfall Averages for British Columbia, n.d.).

e) Average first and last frosts: First frost is October 8th, and last frost tends to be April 25th (Frost Dates for Vernon, BC, n.d.).

f) Growing season: Averaging 165 GDD's, between end of April and beginning of October (Frost Dates for Vernon, BC, n.d.).

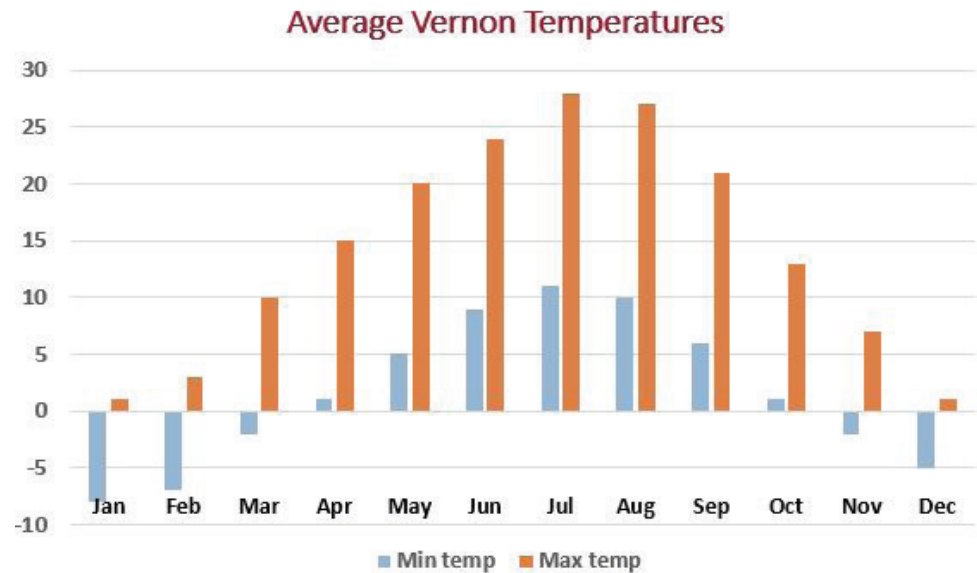


Figure 2: Average Vernon Temperatures ((Climate and Average Weather Year Round in Vernon, n.d.).

## 2.4 Property Ecology

In 2019, Associated Environment (AE) published a Biophysical Survey report on the BX Ranchlands and provided a comprehensive assessment of the site. AE identified 6 distinct ecological zones based on habitat and vegetation type, and the approximate area occupied (Associated Environmental, 2019); see in Figure 4:

1. **Mature Douglas-fir forest:** 5-acres with low levels of invasive species;
2. **Agricultural field:** 121- acres, some being rotated in haying fields, has low levels of invasive species infestation (primarily scotch thistle);
3. **East-facing grassy slope:** 1.2 acres comprised of mature shrubs and minimal noxious weeds;
4. **Graminoid wetland:** 1-acre wetland area not directly connected to Hog's Gulch, drains south into Radies Wetland;
5. **Hog's Gulch:** 700m in length running through the property from a cattail wetland at the West side of property to the South perimeter where it drains onto an adjacent property;
6. **Farmhouse area:** Seven acres; four outbuildings (barns, sheds, etc.) and main area for equipment storage.

## 2.5 Wildlife

With its various ecological zones and natural corridors that offer movement between the BX creek in the north, to the Mutrie Dog Park in the west, to the east-facing slopes, farmhouse area, and various wetlands, BX Ranchlands is home to a diverse range of species (AE Ecological Study):

- **Small mammals and amphibians:** mice, voles, shrews, Pacific tree frogs, etc.
- **Medium to large mammals and predators:** deer, reptiles (i.e. North American racer), coyote, American badger, black bear, etc.

- Birds:** There have been 93 bird species observed on the property (including 8 transitory species). A few of these bird species include: Great blue heron, Swainson’s Hawk, barn swallow, and rough-legged hawk (Associated Environmental, 2019).

The farmhouse area has multiple barn buildings that offer roosting habitat for some species of bats (i.e. little brown myotis) and owls. The property in general provides habitat for 13 wildlife species provincially listed under conservation concern designations shown in Table 1.

Table 1: Provincially Listed Wildlife Species

Endangered	Threatened	Special Concern
American Badger	Great basin spadefoot toad	Spotted bat
Little brown myotis bat	North American race snake	Northern runner boa
	Great basin gopher snake	Western harvest mouse
		Western toad
		Painted turtle

Pocket gophers are the most common pest, which could be problematic for market garden crops. The variety of crops that have been grown on the site is limited, so there may be other problems that have not yet been identified. These could include carrot rust fly, wireworms, and lygus bugs, as they are all pests identified on other farms in the North Okanagan (Insects & Mites, n.d.).

## 2.6 Water

**Drainage:** There is no drain tile installed in the fields. There is natural drainage to the south and west, culminating in the lowest portion of Hog’s Gulch where it exits the property in the South Central area, as well as to the Graminoid Wetland, located in the South East.

**Irrigation:** Irrigation was originally gravity-fed ditched irrigation from BX Creek, and an intake and pumps were in use by the 1980s (and likely earlier). The irrigation system previously consisted of a 100 horsepower pump with three phase power at the creek intake to pump water up the embankment to the North end of the property. There was



Map 1: Current Site Conditions (including habitat and trail)

a pump house located there (now relatively derelict) where a second 'booster' 80 horsepower booster pump was located to get the water distributed to the southernmost part of the property. The distribution mainline consists of above-ground metal piping that is 8 inches in diameter and then sizes down to 6 inches, and then 4 inches to maintain water pressure. This infrastructure is still usable, but will require some maintenance, namely new gaskets.

There are currently 28,500 cubic meters of water available annually from the Greater Vernon Water District, enough water for approximately 19 acres of irrigation (if water is used for irrigation from April 1st to October 31st- if water is used beyond this date range the total irrigable area would be less). This water is treated along with the rest of the municipal water, and is therefore potable and good for washing ready-to-eat produce like salad greens and strawberries.

The 28,500 cubic meters of water is delivered through the use of five, separately metered, municipal water access points, allowing easy monitoring of the water allocation for different areas moving forward. Four of the five access points have two-inch connections, while the fifth (at the most south-easterly point of the property) has only a ¾ inch connection. The RDNO parks department verbally committed to moving the three connection points that have been subdivided with the 35 acres of land that now makes up the 060 trail, on the property. These connections will not be accessible to users at BX Ranchlands until they are moved onto the arable land owned by Electoral Areas B and C, as there is currently a fence separating them from the remainder parcel which would be used for farming.

The other source of irrigation water, and by far the greater volume of water allocated to this parcel of land is from BX Creek. The water license associated with Lot 51 (BX Ranchlands) dates back to 1873. This water license, among the oldest in the area, includes 328,000 cubic meters of water, and would allow for the watering of more than 135 acres from April 1st to October 31st.

In 2017 the existing water intake on BX Creek was washed out by a significant flood event, and has yet to be reconstructed. Both pumps have been deemed in need of replacement, based on an estimate from Mountain View Electric, who will be installing the new system.



Image Source: Jenn Cline

### Municipal Water Service Access

A significant and limiting factor related to creek water is the water restrictions that come into effect annually due to low flow volume in the creek. 2021 water restrictions cut off the supply of irrigation water completely as of July 29th, and climate change means that historical flow and precipitation cannot be relied on for future projections as reliably. As such, a reservoir, 1 acre by 16 feet deep, has been planned, with the intention to expand the area of the reservoir to 2 acres after several years. A reservoir of one acre would hold over 19,500 cubic meters of water, and would allow for the additional irrigation of 18.5 acres of land from July 15th to October 31st. There are already plans to expand the 1 acre reservoir, scheduled to be built in 2022, to a 2 acre reservoir, providing an additional 19,500 cubic meters of water. The electrical requirements for the new system are yet to be fully determined, but electricity will likely be needed to be reinstalled at both the creek intake and



the reservoir location.

## 2.7 Current Utilities

Table 2: Current Site Utilities

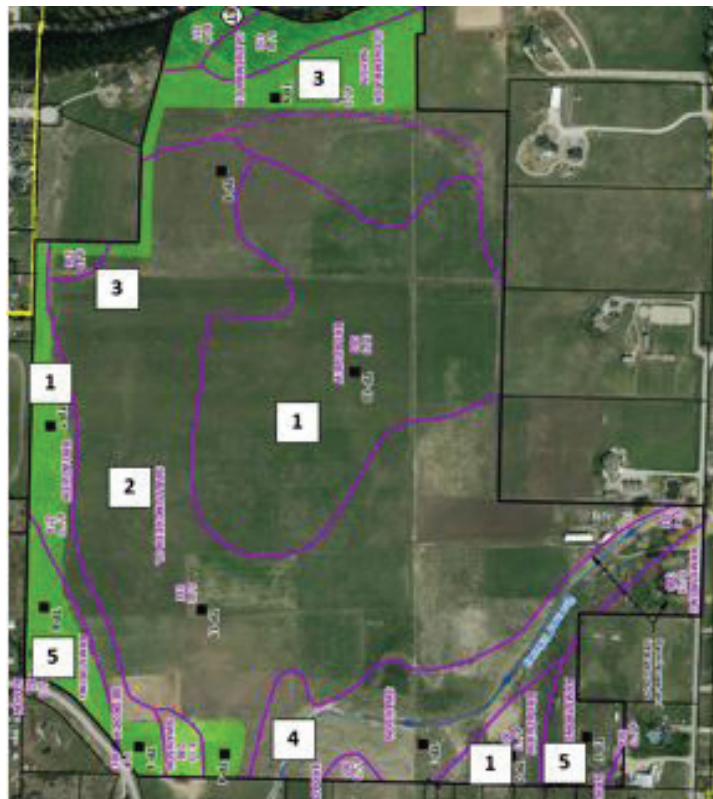
Service	Available	Required	Current Connection Type
Water (municipal)	Yes	Yes	Either 2 or 3/4 inch connection
Electricity	Yes	Yes	Will require reinstating electrical service. Current service is at the parking lot, and will need to be extended to farmyard area.
Sewer	No; surrounding properties on septic	No	None
Road Access	Yes	Yes	Off of East Vernon Road

## 3. Soil Analysis

### 3.1 Soil Test

Soil tests completed in 2015 indicated low levels of nitrogen, consistent with regular harvest of alfalfa and grass hay from the land (Summit Environmental Consultants Inc, 2015). The current farmer on the land, Allan Arndt, uses a moderate amount of nitrogen fertilizer as a top dressing every second year. 2015 tests indicated some low levels of micronutrients including Copper, Zinc, Iron, and Boron, and in some test plots Magnesium was also lacking (Summit Environmental Consultants Inc, 2015).

**Recommendations:** Low and very low nutrients should be addressed based on the requirements of crops planned, and planted on the land. Ideally, naturally occurring forms of nitrogen fertilizer would be used, for example composted manure, or rotational grazing of livestock across farmland in order to capture manure and increase nutrient levels in a targeted way.



Map 2: Soil types and locations

### 3.2 Agricultural Capability

The BC Soil Finder Information tool (BC SIFT) is an online resource from the Government of British Columbia that provides information on specific soil types and their agricultural capabilities (Province of British Columbia). While soil tests organic matter levels, and physical attributes of a piece of farmland can change over time depending on production and agriculture practices, the characteristics of soil texture and characteristics of the land do not change much. The BC SIFT tool provides information on the soil texture and characteristics. According to BC SIFT, BX Ranchlands contains 5 different soil series types, each with approximate percentage of



land it covers on the site (see in Map 2):

1. Broadview (30%)
2. Spallumcheen (40%)
3. Nahun (13%)
4. Swanson/Nisconlith (10%)
5. Armstrong (7%)

Table 3: BC SIFT Tool Soil Texture and Characteristics

Soil Type	Published Unimproved Capability rating (and limitations)	Assessed Unimproved Capability rating (and limitations)	Assessed Improved Capability rating (and limitations)
<b>Broadview</b> (clay and clay loam soil, moderately well drained)	7(3AD) 3(3ADT)	4A	3A
<b>Spallumcheen</b> (silty clay, imperfectly drained)	3(AD)	5(4A) 5(3A)	2D
<b>Nahun</b> (sandy loam, well drained)	7(4AP) 3(4AT)	4AP	3P
<b>Swanson/Nisconlith</b> (clay loam, poorly drained)	5(5W) 5(5WI)	5W	4W
<b>Armstrong</b> (sandy loam, well drained, and unidentified bedrock)	5TA	5TA	5T
* A indicates Soil Moisture Deficiency * D indicates Undesirable soil structure and/or low permeability * Indicates Inundation by streams or lakes		* P indicates Stoniness * T indicates Topography limitation * W indicates Excess water	

There are 7 agricultural capability classes; class 1 lands have the highest agricultural capability while class 7 have the lowest rated soils. Table 3 shows that BX Ranchlands contains Class 3, 4, and 5 soils. The subscript numbers represent the percentage of land that is in a certain class and subclass designation. According to the BC SIFT Tool data in Table 3, Broadview soil on site is 70% Class 3 soil with soil moisture deficiency (A) and undesirable soil structure and/or low permeability, and 30% Class 3 A, D, and topography limitations (T). Unimproved, this soil is designated Class 4 with soil moisture deficiency (A). With improvement, it can become Class 3 with soil moisture deficiency (A).

To better understand Class 3, 4, and 5 soils, BC SIFT describes them as follows:

**Class 3:** Moderate limitations, moderate conservation practices required; may affect crop choice and affect timing/ease of tilling, planting, and harvesting, and methods of soil conservation (Ministry of Environment & Ministry of Agriculture and Food, 1983, 9).

**Class 4:** Severe limitations, affecting crop type and yield; may affect crop choice and affect timing/ease of tilling, planting, and harvesting, and methods of soil conservation (Ministry of Environment & Ministry of Agriculture and Food, 1983, 11).

**Class 5:** Forage crops improvement practices feasible; affects producing perennial forage crops; “can be used for cultivated field crops provided unusually intensive management is employed and/or the crop is particularly

adapted to the conditions peculiar to these lands” (Ministry of Environment & Ministry of Agriculture and Food, 1983, 11).

The below table describes the soil characteristics of the Broadview, Spallumcheen, and Nahun soils and how it pertains to farming (Province of British Columbia).

Table 4: Broadview Soil (Descriptions of soil BCBDV, n.d.)

Characteristic	Description	In the context of crop production
<b>Soil texture</b>	Silty clay indicates that parent material is stone-free, silty clay loam to silt particle texture.	<p>Pros:</p> <ul style="list-style-type: none"> <li>Stone-free eliminates a big issue of machinery damage when working the soil.</li> <li>Increased water holding capacity in the soil, so that crops will not require as much irrigation in the hot dry summer months.</li> <li>Increased nutrient holding capacity in the soil, which is beneficial for plant growth.</li> </ul> <p>Cons:</p> <ul style="list-style-type: none"> <li>Excess water due to poor drainage creates water logging which can damage plant growth; shallow water table contribute to this.</li> <li>Farming seasons can be delayed due to soils taking longer to dry out, especially compared to farms that have more sand-based soil type.</li> <li>If heavy machinery (e.g. tractor) is used on the soil before it dries, it will create a hard-pan layer which limits the depth at which plant roots can grow and damages soil structure.</li> </ul>
<b>Elevation and slope</b>	Found at elevations between 1,130 and 1,400 ft	Gently sloping from north to south, and west to east to the valley bottom. Slope varies from 0-8%.
<b>Drainage</b>	Moderately well drained	Some methods to cope with poor drainage include: 1) adding organic matter over time to build soil structure, 2) timed tilling and other cultivating techniques to prevent excessive structural degradation, 3) installing drainage tiles, 4) building swales and ditches into the field layouts, 5) covering soil with tarps or cover cropping to prevent excessive soil degradation in the winter months, and 6) periodical subsoiling to increase soil aeration and drainage.
<b>Acidity</b>	pH 6.3	The ideal acidity for growing vegetables is between 5.5-7. Different vegetables require varying levels of pH, so amendments to make the soil more basic or acidic will be needed depending on crop needs.
<b>Organic Matter</b>	6.8%	A percentage range between 8-12% is considered appropriate. It is recommended good practice to try and increase the OM over time through practices like using cover crops, green manure crops, and mature compost/manure additions.

Table 5: Spallumcheen Soil (Descriptions of soil BCSLC, n.d.)

Characteristic	Description	In the context of crop production
<b>Soil texture</b>	Silty clay loam indicates that the parent material is fine to fine-textured particles; topsoil is clay loam.	<p>Pros:</p> <ul style="list-style-type: none"> <li>• Stone-free eliminates a big issue of machinery damage when working the soil.</li> <li>• Increased water holding capacity in the soil, so that crops will not require as much irrigation in the hot dry summer months.</li> <li>• Increased nutrient holding capacity in the soil, which is beneficial for plant growth.</li> <li>• Drought resistant and very productive.</li> </ul> <p>Cons:</p> <ul style="list-style-type: none"> <li>• Excess water due to poor drainage creates water logging which can damage plant growth; shallow water table contribute to this.</li> <li>• Farming seasons can be delayed due to soils taking longer to dry out, especially compared to farms that have more sand-based soil type.</li> <li>• If heavy machinery (e.g. tractor) is used on the soil before it dries, it will create a hard-pan layer which limits the depth at which plant roots can grow and damages soil structure.</li> </ul>
<b>Elevation and slope</b>	Found at elevations between 1,300 and 1,500 ft	Topography is mostly flat, with gentle slope towards the valley bottom; Slope varies from 0-15%, average around 3%.
<b>Drainage</b>	Well to moderately well drained	<ul style="list-style-type: none"> <li>• Slowly pervious (from the clay) and very easily erodible (larger textured silt particles).</li> <li>• Some methods to cope with poor drainage include: 1) adding organic matter over time to build soil structure, 2) timed tilling and other cultivating techniques to prevent excessive structural degradation, 3) installing drainage tiles, 4) building swales and ditches into the field layouts, 5) covering soil with tarps or cover cropping to prevent excessive soil degradation in the winter months, and 6) periodical subsoiling to increase soil aeration and drainage.</li> </ul>
<b>Acidity</b>	pH 6.6	The ideal acidity for growing vegetables is between 5.5-7. Different vegetables require varying levels of pH, so amendments to make the soil more basic or acidic will be needed depending on crop needs.
<b>Organic Matter</b>	6.8%	A percentage range between 8-12% is considered appropriate. It is recommended good practice to try and increase the OM over time through practices like using cover crops, green manure crops, and mature compost/manure additions.

Table 6: Nahun Soil (Descriptions of soil BCNHUer,n.d.)

Characteristic	Description	In the context of crop production
<b>Soil texture</b>	Gravelly sandy loam indicates that the parent material is stony and sandy, with lower levels of gravel and loam.	<p>Pros:</p> <ul style="list-style-type: none"> <li>• Because of its rapidly draining soil, it is the first area that could be cultivated in the spring.</li> <li>• Soil texture could support some native plant species that are drought tolerant.</li> <li>• Less likely to compact</li> </ul> <p>Cons:</p> <ul style="list-style-type: none"> <li>• Very rapidly draining soil, with low water holding capacity, thus low nutrient holding capacity.</li> <li>• Stoniness can hinder soil cultivation by potentially damaging equipment.</li> </ul>
<b>Elevation and slope</b>	Found at elevations between 1,00 and 1,800 ft	Topography is mostly flat, with gentle slope towards the valley bottom; Slope varies from 0-15%, average around 3%.
<b>Drainage</b>	Well drained	Water is removed readily but not rapidly from the soil. Excess water flows downward or laterally as subsurface flow. Soils have intermediate available water storage capacity within the top 5 cm. Adding organic matter overtime will increase the water holding capacity of the soil.
<b>Acidity</b>	pH 6.4	The ideal acidity for growing vegetables is between 5.5-7. Different vegetables require varying levels of pH, so amendments to make the soil more basic or acidic will be needed depending on crop needs.
<b>Organic Matter</b>	5.8%	A percentage range between 8-12% is considered appropriate. It is recommended good practice to try and increase the OM over time through practices like using cover crops, green manure crops, and mature compost/manure additions.

### 3.3. Management Considerations for Improving the Soil

Despite this parcel being Class 3, 4, and 5 soils, experts state that this parcel has potential to have some areas improve to a Class 2 & 3 with proper management (Canadian Land Inventory, 2013). By definition:

Class 2: “Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices. The soils are deep and hold moisture well. The limitations are moderate and the soils can be managed and cropped with little difficulty. Under good management they are moderately high to high in productivity for a fairly wide range of crops” (Ministry of Agriculture and Food; Ministry of Environment, 1983).



**Class 3:** “Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices. The limitations are more severe than for class 2 soils.

They affect one or more of the following practices: timing and ease of tillage, planting and harvesting, choice of crops, and methods of conservation. Under good management they are fair to moderately high in productivity for a fair range of crops” (Ministry of Agriculture and Food; Ministry of Environment, 1983).

Based on the BC SIFT tool and KPU ISFS team’s expertise with these soil types, excess water and weak soil structure are usually the main challenges. If these two aspects are managed well and improved over the years, the BX Ranchlands has the potential of improving to Class 2 and 3 land, suitable for annual and perennial field crops, and annual forage crops. KPU ISFS defined the effects these issues would have on crops, and offered recommendations on how to improve the soil:

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**EFFECT ON CROP GROWTH:** Crops are killed or reduced in yield due to poor drainage and its restriction on root growth. Poor drainage and clay soils results in poor germination of seed, uneven maturity of crops and poor crop quality. Soil aeration and nitrification are reduced due to the high-water table: calcium, nitrogen and other leachable nutrients leech from the soil with the water table fluctuation. The poor drainage is most damaging to perennial crops like fruit trees, particularly during wet winter months. Annual crops are also affected as cultivation is difficult on wet soils and planting dates are later as a result.

**MANAGEMENT CONSIDERATIONS:** Soils on this property vary and so management techniques should be adapted to different soil types where possible. A mix of cover cropping (i.e. daikon radish) and subsoiling could be used to reduce compaction in heavier clay soils (i.e. Broadview, Spallumcheen, and Swanson soils). Initial subsoiling in these heavier clay areas would improve soil aeration and water draining capacity (Summit Environmental Consultants Inc, 2015, 13). Rotating livestock with annuals or across perennial forages would increase the nutrient content in the soil. Working the land, or moving livestock across the land, should only be done when levels of soil moisture are low enough that these activities are not detrimental or leading to additional compaction.

**AMENDMENTS:** Organic matter is the primary amendment listed in the agricultural capability report completed in 2015 (Summit Environmental Consultants Inc, 2015). This is particularly with reference to the fast-draining soils with higher gravel content (Nahun and Armstrong).

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## 4. Land Use History from Current Tenant

Allen Arndt has been farming the BX Ranchlands since 1986 when he began leasing it from Peter Huver. Since then he has seeded it with alfalfa and a variety of grasses, including timothy in the lower, wetter areas. He has, in the past, over-wintered cattle on the site, but not for over ten years. He has always been responsible for mowing and maintaining the site, and has taken on paying for certain upgrades (e.g. barns, a former electrical power connection to the barnyard etc.).

Allen primarily irrigates using a wheel line, and some small reels. Until the BX Creek water intake was destroyed by a flood in 2017, he also irrigated from the BX Creek water license. Currently he uses the 28,500 cubic metres of water allocated by the Greater Vernon Water District license, and waters sparingly, covering approximately 35 acres over the course of the season.

While irrigation is required for regular harvests of forage crops, Allen does not discount the possibility, and profitability, of growing dryland forage crops on the site. He is most interested to see innovative and passionate new farmers on the land, and is open and willing to work with new farmers of different types in the next couple of years whether as a mentor, or to perform preparatory tractor work (e.g. tilling etc.).

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